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准噶尔盆地北缘中中新世啮齿类

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关键词 准噶尔盆地 哈拉玛盖组 中中新世 啮齿目

内 容 提 要

本文记述了新疆准噶尔盆地北缘，乌伦古河沿岸哈拉玛盖组中中新世动物群中的啮齿类，共三属四种。其中，*Sinomylagaulus halamagaiensis* gen. et sp. nov., *Atlantoxerus junggarensis* sp. nov. 和 *A. giganteus* sp. nov. 分别是 Mylagaulidae（圆齿鼠科）和 *Atlantoxerus*（阿特拉地松鼠）在我国的首次记录。*Amblycastor tungurensis* 的存在表明该动物群的时代大致为通古尔期，与欧洲陆生哺乳动物分期 MN 7—8（Astaracian）相当。

一、前 言

中国科学院古脊椎动物与古人类研究所新疆考察队在 1982 年野外工作季度中，于准噶尔盆地北缘、乌伦古河沿岸的播塔莫音和铁尔斯哈巴合（两地相距十公里，均位于福海县境内）的哈拉玛盖组下部哈拉玛盖段地层露头表面采集到七枚中新世啮齿类单个颊齿。它们与铲齿象、皇冠鹿、柄杯鹿等中新世大哺乳动物共生。这些标本分属于三科三属四种。

圆齿鼠科（Mylagaulidae）: *Sinomylagaulus halamagaiensis* gen. et sp. nov.

松鼠科（Sciuridae）: *Atlantoxerus junggarensis* sp. nov., *A. giganteus* sp. nov.

河狸科（Castoridae）: *Amblycastor tungurensis* Stirton, 1934

过去，在新疆境内还未曾有过中新世啮齿类的记载。这次采集的材料虽少，却填补了我国中新世啮齿类在这个地区的空白，而且，其中 mylagaulid（圆齿鼠类）和 *Atlantoxerus* 在我国尚属首次发现[1)]。

本文描记了上述材料。研究过程中，古脊椎动物与古人类研究所的王伴月、齐陶同志，法国里昂克劳德·贝尔纳大学的 P. Mein 教授，西德慕尼黑大学 V. Fahlbusch 教授、美因兹大学 N. Schmidt-Kittler 教授和苏联科学院古生物研究所 N. Shevyreva 博士给予热情帮助，采集化石的同志付出了辛勤的劳动，沈文龙同志绘制插图，作者谨向他们致以热忱的谢意。

标本保存在中国科学院古脊椎动物与古人类研究所。

1）李传夔与邱铸鼎 1980 年记述的青海湟中早中新世的 *Sciurid* sp.（古脊椎动物与古人类，**18**(3)，201 页，图版 I，2）很可能属 *Atlantoxerus*。

二、标本记述

山河狸超科 Aplodontoidea Matthew, 1910
？圆齿鼠科 ？Mylagaulidae Cope, 1881
原圆齿鼠亚科 Promylagaulinae Rensberger, 1980
中国圆齿鼠（新属）*Sinomylagaulus* gen. nov.

属名由来 *Sino*（拉），中国的，*mylagaulus* 圆齿鼠。属名意为：在中国发现的圆齿鼠。

属型种 *Sinomylagaulus halamagaiensis* sp. nov.

属的特征 同属型种的特征。

哈拉玛盖中国圆齿鼠（新种）*Sinomylagaulus halamagaiensis* sp. nov.

（图 1）

正型标本 右 P^4 一枚，V8107。

模式产地 乌伦古河北岸，铁尔斯哈巴合，野外地点号 82513。

时代与层位 中中新世，哈拉玛盖组下部（哈拉玛盖段）。

种名由来 Halamagai，化石产出层位名称的汉语拼音。

种的特征 P^4 齿冠高，齿冠垂直轴凸弯向舌面。齿冠嚼面长大于宽；前边尖稍向舌侧扩展；前附尖及中附尖呈不很发育的脊；有六个齿凹，前唇侧凹与前舌侧凹在前端相连，中凹二分。齿根下部收缩、开口。

描述 P^4 齿冠高，舌侧高于唇侧；前窄后宽，长度大于宽度；齿冠垂直轴弯曲，凸向舌侧。前边尖发育，明显向前突出且稍移向舌侧。前附尖和中附尖呈不很发育的脊状，前附尖位于前唇侧凹的前唇侧，下端稍向前偏，在齿冠高度上部三分之一处消失；中附尖位于中凹后唇侧，下端稍偏向后方，并在齿冠高度五分之四处消失。前唇侧凹（anterolabial fossette）与前舌侧凹（anterolingual fossette）长，两凹在前端相连成[形凹。后唇侧凹（posterolabial fossette）及后舌侧凹（posterolingual fossette）都小于前凹。中凹（transverse central fossette or valley）分为唇侧和舌侧两个小凹，唇侧中凹横向延伸，舌侧中凹小，呈圆形。六个凹都向齿冠内部延伸较深。齿根与齿冠间界限明显。齿根长，末端收缩，但开口，其前部侧扁。根据标本判断，齿根可能不分岔或分岔部位很低。齿冠最大长度、宽度和高度分别为 3.89、3.00 和 5.52 毫米。

比较和讨论 Mylagaulidae 是一类特化的绝灭了的啮齿类动物，它与 Aplodontidae（山河狸科）同属于 Aplodontoidea（山河狸超科）。目前，Mylagaulidae 在北美有 7 个属：*Mylagaulodon*、*Mesogaulus*, *Mylagaulus*、*Epigaulus*, *Ceratogaulus*, *Promylagaulus* 和 *Crucimys*，分布于晚渐新世（Arikareean）至晚中新世（Hemiphillian）地层中。在亚洲有产自苏联东哈萨克斯坦斋桑盆地，中中新世萨勒布拉克组（Sarybulak Formation）的 *Tschalimys čkhikvadzei*。在其它大陆尚未发现此类动物的踪迹。

在以上各属内，*Mylagaulus*, *Epigaulus* 和 *Ceratogaulus* 的颊齿无齿根，咀嚼面

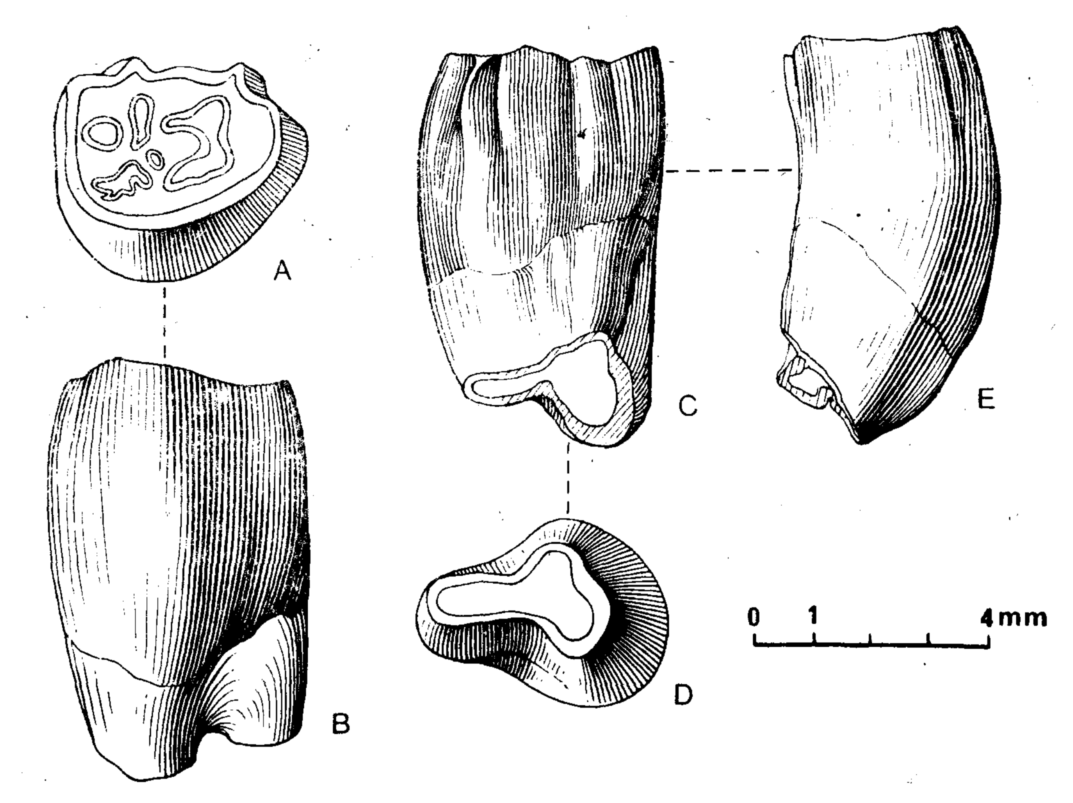


图 1 哈拉玛盖中国圆齿鼠(新属、新种)

Fig. 1 *Sinomylagaulus halamagaiensis* gen. et sp. nov.

右 P^4 (P^4 dext.) V8107, 正型标本 (Holotype), A—E: 冠面视 occlusal view; 舌面视 lingual view; 唇面视 labial view; 底面视 bottom view; 后面视 posterior view

多狭长的齿凹,可与新疆标本明显区分。*Mesogaulus* 属的 P^4,以其较狭长的卵圆形横截面、较稳定的 Y 形前唇侧凹、发育的柱状中附尖和缺失前附尖等特征区别于新疆标本。*Mylagaulodon* 属的 P^4 与新疆标本的主要差异在于它有明显的三分岔齿根、Y 形的前唇侧齿凹、缺失中齿凹和齿冠垂直轴直。在已描述过的 *Crucimys* 的标本中尚无 P^4, 因此无法与新疆标本直接对比。与美国西部落基山和大平原早中新世 (Arikareean) 的 *Promylagaulus* 比较,它们在齿冠高、有齿根、齿冠垂直轴向舌侧弯凸、齿冠咀嚼面长大于宽、前边尖稍移向舌侧、有不很发育的脊形前附尖和中附尖等特征方面是相似的。但二者也有较显著的差别。*Promylagaulus* 的 P^4 齿冠较低,咀嚼面只具三至四个齿凹,其前舌凹和后唇凹一般较小较浅,无中凹,且两前凹不相连。在新疆标本的嚼面上具有六个齿凹,其中包括两个中凹,前唇凹与前舌凹在前方相连;所有齿凹都向齿冠基部延伸较深,因此齿凹数看来并不随磨蚀程度的不同而有很大的变化。在齿冠外壁形态方面,*Promylagaulus* 的 P^4 的外壁在中附尖前向舌侧凹陷,在新疆标本的磨蚀面上,其中附尖前后的外壁成一直线,但在齿冠稍下部中附尖前的外壁也稍凹陷,因此还不能确定它与 *Promylagaulus* 在这一性状上是否有很大差异。

与亚洲的 *Tschalimys čkhikvadzei* 比较，新疆的标本在大小、齿冠高度、嚼面轮廓、齿凹的数目和布局方面与它较相似。但据 Shevyreva (1971) 的描述，*Tschalimys čkhikvadzei* 无齿根，而且从插图来看，其齿冠垂直轴是不弯曲的(原作者没有描述这一性状)。这两性状的差异决定了新疆标本不可能与 *Tschalimys* 同属。此外，后者只有一个中凹，两前凹不相连，前附尖分叉。

有趣的是，新疆标本的嚼面图式还与北美 Aplodontidae (山河狸科)的 *Tardontia* 和 *Meniscomys* 十分相像。*Tardontia* 产自北美西部大盆地地区内华达州 (Nevada) 的中新世地层，共两个种。中中新世 (Barstovian) 的 *Tardontia nevadans* Shotwell, 1958 的 P^4 可与新疆标本比较。两者齿冠嚼面上的齿尖、齿凹的数目和布局相似，但 *Tardontia nevadans* 的齿冠较低，垂直轴不弯曲，齿根三分，且分岔部位较高。Shotwell 没有描述 *Tardontia* 的前附尖和中附尖，从插图判断，这两附尖都较新疆种者发育。*Meniscomys* 在前附尖及中附尖为脊形、前唇侧凹及前舌侧凹在前方连通、有中凹等方面与新疆标本相似，但齿冠低、长宽比较小(即齿冠较短)、前附尖及中附尖更发育、齿凹浅、仅一个中齿凹。

由上述比较可以认为，新疆标本是不同于以上各属的一个新属种，命名为 *Sinomylagaulus halamagaiensis*。至于它与各属的系统发育关系，还难于确定。虽然它与 *Meniscomys, Tardontia, Tschalimys* 和 *Promylagaulus* 在形态上都很相似，但基于它与 *Promylagaulus* 具有更多共同的衍生特征：嚼面呈长卵圆形、齿冠高、齿冠垂直轴凸弯向舌侧、不发育的脊形的前附尖和中附尖，可以认为它与 *Promylagaulus* 的关系最亲近。Rensberger 1980 年建立了一个新亚科 Promylagaulinae (原圆齿鼠亚科)，包括 *Promylagaulus* 和 *Crucimys* 两个属。我们暂将 *Sinomylagaulus* 纳入该亚科。Rensberger (1980, 1274 页) 认为，原圆齿鼠类看来不是圆齿鼠亚科 Mylagaulinae 的祖先，但两者之间的关系较之与山河狸超科内其它各类的关系更为接近，因此最好将该亚科暂放在 Mylagaulidae 中。

松鼠科 Sciuridae Gray, 1821

阿特拉地松鼠 *Atlantoxerus* Major, 1893

准噶尔阿特拉地松鼠(新种)

Atlantoxerus junggarensis sp. nov.

(图 2, A—D)

正型标本　一枚左 P^4 (V8105.1)

副型标本　一枚右 $M_{1/2}$ (V8105.2)

归入标本　一枚左 $M_{1/2}$ (V8105.3) 及一残破右 M_3(V8105.4)。

模式产地　新疆准噶尔盆地，乌伦古河北岸，铁尔斯哈巴合。野外地点号 82513。

时代与层位　中中新世，哈拉玛盖组下部(哈拉玛盖段)。

种名由来　*Junggar*，化石产地准噶尔盆地的汉语拼音。

种的特征　个体大，仅次于本属最大种 *Atlantoxerus giganteus*。P^4 次尖很不发育；原小尖不发育；后小尖不与原小尖和后边脊相连；中附尖小。下臼齿无下前边尖；下后

脊不与下后尖相连；下内脊发育，连接下内尖和下次小尖。下外脊发育。M_3 长宽相等。

描述 P^4 (V8105.1) 齿冠舌侧壁高耸，齿冠嚼面略呈倒梯形。前边尖发育，向前突出；中附尖小；次尖很不发育；原小尖略小于前尖；后小尖较后尖发育、膨大，舌侧不与原尖相连，但其后壁与后边脊相接触。后边脊低，与后脊之间的谷几乎消失。前边脊发育，其前内侧有一明显的与 P^3 的接触面。

$M_{1/2}$ 齿冠宽大于长。嚼面呈平行四边形。无下前边尖；下后脊中断，不与下后尖相连；下内脊发育，连接下内尖及下后边脊于下次小尖；下外脊直；下原尖和下次尖间的外谷向后斜。V8105.3 磨蚀很深。但仍可辨认出下后脊中断，下内脊与下后边脊相连，下外脊发育等特征。下后尖与下内尖之间的缺口较在 V8105.2 的深。四齿根。

M_3 磨蚀较深，齿前缘珐琅质破损，珐琅质显得较其它牙齿的厚。齿宽等于齿长。下后脊中断，不与下后尖相连；下内脊与下后边脊相连；下外脊发育。

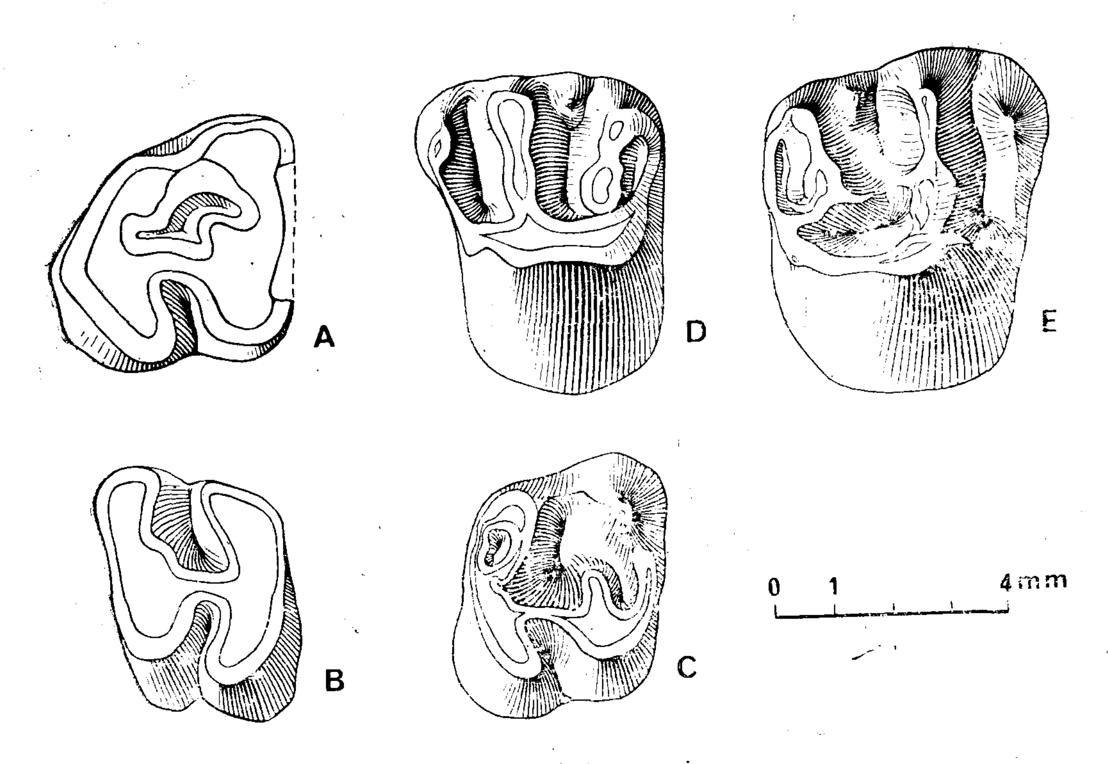


图 2 阿特拉地松鼠 *Atlantoxerus*

Fig. 2 A—D 准噶尔阿特拉地松鼠(新种) *Atlantoxerus junggarensis* sp. nov.

A: 左 M_3 (M_3 sin.) V8105.4;

B: 左 $M_{1/2}$ ($M_{1/2}$ sin.) V8105.3;

C: 右 $M_{1/2}$ ($M_{1/2}$ dext.) V8105.2，副型标本 paratype;

D: 左 P^4 (P^4 sin.) V8105.1，正型标本 holotype;

E: 巨大阿特拉地松鼠(新种)

A. giganteus sp. nov. 右 P^4 (P^4 dext.) V8106，正型标本 holotype

巨大阿特拉地松鼠(新种) *Atlantoxerus giganteus* sp. nov.

(图 2, E)

正型标本 右 P^4, V8106。

模式产地 新疆准噶尔盆地，乌伦古河北岸，铁尔斯哈巴合。野外地点号 82513。

时代与层位 中中新世，哈拉玛盖组下部(哈拉玛盖段)。

种名由来 *gigante* (拉)，极大的，以表示该种是迄今属内最大者。

种的特征 *Atlantoxerus* 属的最大种。P^4 次尖很不发育；原小尖较发育；后小尖以小脊与原小尖和后边脊相连；中附尖小。

描述 本种仅以一右 P^4 为代表。齿冠高，齿冠舌侧面高耸。前边尖很发育，向前突出。有较小的中附尖。次尖很不发育，几乎融汇在原尖后臂内。原小尖膨大，稍大于前尖。后小尖较后尖发育，后舌侧与后边脊以一小脊相连，向前以一小脊与原小尖基部相连。前边脊发育，后边脊低窄，与后脊之间的第三谷极窄。

比较和讨论 *Atlantoxerus* 的属型种 *A. getulus* (Linnaeus, 1758) 是生活在北非摩洛哥和阿尔及利亚的唯一现生种。Lavocat 1961 年描述了在摩洛哥中中新世 Beni-Mellal 动物群中发现的它的第一个化石代表。他当时虽已注意到北非的这个化石种与 *A. getulus* 很相似，但并没将它归入 *Atlantoxerus* 属，却另立一新属，并以它作为新属的属型种，命名为 *Getuloxerus tadlae*。此后，*H. de Bruijn* (1965), H. de Bruijn 和 P. Mein (1968) 相继描述了西班牙卡拉塔尤德 (Calatayud) 地区的两个新种：中中新世 (Valtorres MN 4) 的 *G. blacki* 和晚中新世 (Los Mansuetos MN 12) 的 *G. adroveri*。后来，H. de Bruijn, M. R. Dawson 和 P. Mein (1970) 在研究希腊罗得岛 (Rhodes) 上新世 (Maritsa MN 14) 的小哺乳动物时观察到，Maritsa 的标本具有许多化石属 *Getuloxerus* 和现生属 *Atlantoxerus* 共有的特征，它们在牙齿性状上的差别仅是种间差别。他们建议取消属名 *Getuloxerus*。此后，各化石种都被归入 *Atlantoxerus*。在发现新疆标本之前，该属分布在环地中海地区的北非、欧洲和西亚地区，西起西班牙，东至沙特阿拉伯和土耳其；从中中新世早期延续至现在。表 1 是现有各种的地理地史分布及颊齿测量数据对比表。

新疆准噶尔盆地哈拉玛盖组中发现的材料，依据其 P^4 具有发育的后小尖，后小尖不与舌侧尖相连，下颊齿无前齿带 (anterior cingulum)，$M_{1/2}$ 宽度大于长度和具有发育的下内脊等性状，无疑应归入 *Atlantoxerus* 属。新疆标本中仅有的两枚 P^4, V8106 较 V8105.1 大得多，且以原小尖较发育、后小尖与原小尖和后边脊分别以脊相连等特征区别于后者，应为不同的种。其它三枚下颊齿在大小上可与 V8105.1 相配，应视为同一种。

大种 *A. giganteus* 仅以一枚 P^4 (V8106) 为代表，它显然地大于各已知种。小种 *A. junggerensis* (V8105.1—4) 则大于除北非早更新世的 *A. huvelini* 之外的所有种。在其它形态特征方面，新疆的两个种以其光滑的珐琅质齿面、长宽相等的 M_3 和下内脊发育的下臼齿显然区别于北非种 *A. tadlae* 和 *A. huvelini*。此两北非种的齿面珐琅质多褶皱并有多尖化趋势，下臼齿的下内脊不发育 (由珐琅质颗粒组成)，且 M_3 的长度明显地大于宽度 (见表 1)。新疆种在 $M_{1/2}$ 宽度大于长度、缺失下前边尖和 P^4 后小尖发育等

表1 *Atlantoxerus* 属各种的颊齿测量数据(单位：毫米)

Table 1 Comparison of the cheek teeth of *Atlantoxerus* in measurements (in mm)

种名 Species	地点 Locality	时代 Age	颊齿测量数据(长×宽) Measurements of cheek teeth (L×W) P⁴	M1/2	M3
A. getulus Linnaeus, 1758	Morocco, Algeria 摩洛哥、阿尔及利亚	现代 Recent			
A. huvelini Jaeger, 1977	Morocco (Irhoud-Ocre) 摩洛哥	早更新世 Early Pleistocene		3.77×4.46	4.29×3.49
A. rhodius De Bruijn, Dawson et Mein, 1970	Rhodes (Maritsa I) 希腊罗得岛	上新世 MN 14 Ruscinian	2.22×2.94 (2.10—2.38× 2.75—3.07)	2.49×2.82 (2.40—2.60× 2.71—2.98)	3.05×2.84 (2.92—3.17× 2.78—2.92)
A. adroveui De Bruijn et Mein, 1968	Spain (la Mansuetos) 西班牙	晚中新世 Turolian	2.04×2.67 (1.91—2.15× 2.54—2.78)	2.53×2.69 (2.33—2.78× 2.29—3.07)	2.74×2.76 (2.17—2.96× 2.67—2.87)
A. sp. II Ünay, 1981	Turkey (Bayraktepe II) 土耳其	晚中新世 M. Vallesian	$M^{1/2}$: 3.05×3.95	3.40×3.55	
A. sp. I Ünay, 1981	Turkey (Bayraktepe I) 土耳其	中中新世 L. Aragonian		P_4: 2.70×2.75	
A. tadlae Lavocat, 1961	Morocco (Beni-Mellal) 摩洛哥	中中新世 MN7	2.79×3.64	2.78×3.10 (2.64—3.09× 2.67×3.45)	3.43×3.01 (3.15—3.79× 2.81—3.30)
A. sp. Sen et Thomas, 1979	Saudi Arabia (Al Jadidah, Al Hofuf) 沙特阿拉伯	中中新世 MN 6		M_1: 2.00×2.25 M_2: 2.12×2.15	2.28×2.03
A. blacki De Bruijn, 1966	Spain (Vallorres) 西班牙	中中新世 MN 4	1.83×1.97	2.00×2.70	2.39×2.53
A. giganteus sp. nov.	China (Junggar) 中国	中中新世 MN 7—8	4.86×6.32		
A. junggarensis sp. nov.	China (Junggar) 中国	中中新世 MN 7—8	4.37×5.47	4.05×4.86 3.26×4.37	4.54×4.54

注：测量数据均依原作者 (The data are adopted after the original authors)。

特征方面与欧洲种 *A. blacki*, *A. adroveri*, *A. rhodius* 和北非种 *A. getulus* 相似，但以其 P^4 具不发育的次尖与 P^4 具发育次尖的这些种区分。

A. junggarensis 还以 P^4 后小尖与后边脊之间无小脊相连区别于有此小脊的北非种 *A. getulus*，以下臼齿 $M_{1/2}$ 的下后脊中断和下臼齿下前边尖完全缺失区别于 *A. rhodius*，以 P^4 有中附尖区别于无中附尖的 *A. adroveri*，以下内脊仅与下后边脊相连不同于下内脊尚与下次尖相连的 *A. blacki*。*A. giganteus* 则还以 P^4 具有发育的连结后小尖与原小尖、后边脊的脊区别于 *A. rhodius* 和 *A. blacki*，以具明显的中附尖区别于无中附尖的 *A. adroveri*。此外，*A. junggarensis* 的 P^4 的形态与土耳其 Bayraktepe II 的 *A.* sp. II 的 $M^{1/2}$ 较相似：前边脊发育、次尖不发育，后小尖没有与后边脊相连的小脊，有小的中附尖。

Atlantoxerus 在新疆的发现使该属的地理分布由原来的环地中海地区扩及到中亚。目前，对于 *Atlantoxerus* 属各种间的亲缘和进化关系尚不清楚。就哈拉玛盖的两个新种来看，P^4 的次尖都很不发育，与具有较发育次尖的欧洲各种不同，而与土耳其 Bayraktepe II 的 *A.* sp. II 相似。尤其是 *A. junggarensis* 的 P^4 与 Bayraktepe II 的 *A.* sp. II 的 $M^{1/2}$ 较相似(见前)，且土耳其的种个体也较大。或许 *A. junggarensis* 与土耳其的 *A.* sp. II 之间有较近的亲缘关系。根据现有资料，对于欧、亚和北非 *Atlantoxerus* 各种间的交流迁徙问题还不宜提出任何见解。

河狸科 Castoridae Gray, 1821

笨河狸 *Amblycastor* Matthew, 1918 = *Anchitheriomys* Roger, 1898

通古尔笨河狸 *Amblycastor tungurensis* Stirton, 1934

(图 3)

标本 左 $M^{1/2}$ 一枚，V8133。

地点 准噶尔盆地，福海县，播塔莫因东侧。野外地点号 82502。

时代与层位 中中新世，哈拉玛盖组下部。

这枚属于 M^1 或 M^2 的上臼齿与 *Atlantoxerus junggarensis*, *A. giganteus* 和 *Sinomylagaulus halamagaiensis* 的产出层位相当，但产化石地点相距约 10 公里。标本与 Stirton 1934 年描述的产自内蒙通古尔产铲齿象化石层位的正型标本的大小和形态近似。仅后凹 (metafossette) 较复杂，有两个在唇侧彼此相连的长形凹。有四个前凹，前舌侧的前凹相连成长形凹。这些差异可能都属个体变异。其长、宽、高分别为 7.56, 8.83 和 11.83 毫米。Stirton 没有提供正型标本的测量数据，根据插图度量，其长、宽、高分别大致是 7.70, 10.00 和 12.50 毫米。

Amblycastor 属的最早代表是北美 Nebraska 的中新世 (Hemingfordian) Snake Creek 动物群中的 *A. fluminus* Matthew, 1918，其牙齿嚼面构造较 *A. tungurensis* 简单。后者也曾在苏联东哈萨克斯坦斋桑盆地的中新世层位萨勒布拉克组中发现过 (Agadjanyan, 1985)。因此可以认为含有 *A. tungurensis* 的哈拉玛盖组动物群的时代大致与内蒙通古尔组中中新世晚期动物群和斋桑盆地萨勒布拉克组中新世哺乳动物群的时代相当。据 A. K. Agadjanyan (1985)，萨勒布拉克组的时代可与欧洲陆生哺乳动物

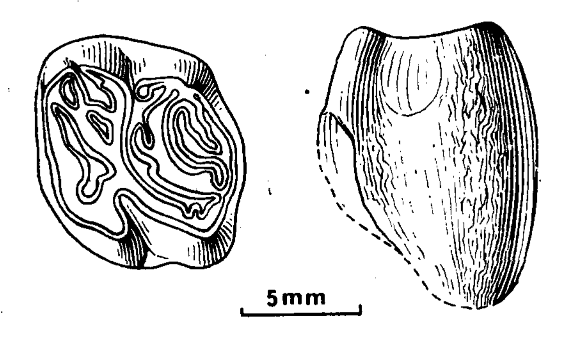


图 3 通古尔笨河狸 *Amblycastor tungurensis*, Stirton, 1934,
左 $M^{1/2}$, V8133,冠面及前面视

Fig. 3 *Amblycastor tungurensis* Stirton, 1934, $M^{1/2}$ sin.,
V8133, occlusal and anterior view

分期的 MN 7—8 (Astaracian) 相比,与目前对我国通古尔动物群的时代估计相当(李传夔等, 1984)。

Schreuder 1951 年研究对比了欧洲(西德巴伐利亚)的 ***Anchitheriomys*** 和北美、内蒙通古尔及苏联高加索的 ***Amblycastor***,认为二者应为同物异名。从牙齿形态来看,他的观点是可被接受的。

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THE FIRST DISCOVERY OF MIDDLE MIOCENE RODENTS FROM THE NORTHERN JUNGGAR BASIN, CHINA

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Key words Northern Junggar Basin; Middle Miocene; Lower Halamagai Formation; Rodentia

Summary

During the field season of 1982 in Northern Junggar Basin, surface collecting by the field party of IVPP at the outcrops of Halamagai Formation provided 7 isolated cheek teeth of rodents associated with some macromammals typical of middle Miocene age: *Platybelodon, Stephanocemas thomsoni, Lagomeryx* sp., etc.

It is the first time that the Miocene rodents are discovered in this region. They belong to 3 genera, 4 species:

Sinomylagaulus halamagaiensis gen. et sp. nov.

Atlantoxerus junggarensis sp. nov.

A. giganteus sp. nov.

Amblycastor tungurensis Stirton, 1934

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All the specimens herein described are stored in the collections of IVPP.

Aplodontoidea Matthew, 1910

?Mylagaulidae Cope, 1881

Promylagaulinae Rensberger, 1980

***Sinomylagaulus* gen. nov.**

Derivatio nominis *Sino* (Latin), Chinese, indicating the mylagauline described is found in China.

Type species *Sinomylagaulus halamagaiensis* sp. nov.

Diagnosis Same as for type species.

***Sinomylagaulus halamagaiensis* sp. nov.** (Fig. 1, A—E)

Derivatio nominis After the Halamagai Formation.

Holotype P^4 dext., V8107.

Type locality Tieershabahe in Northern Junggar Basin.

Type level Lower Halamagai Formation of Middle Miocene

Diagnosis P^4 high-crowned with lingual hypsodonty. Crown curved along vertical axis which lingually convex and labially concave. Occlusal surface longer than wide. Anterocone expanded lingually. Parastyle and mesostyle slightly developed ridge-form. Altogether six fossettes extended far deeply into the tooth. Anterolabial and anterolingual fossettes connected anteriorly, forming [shape. Transverse central fossette divided into two isolated lakes. Tooth root shrinks but opens at lower end.

Description The only representive of this taxon, P^4, is high-crowned with lingual hypsodonty. The crown is curved along the vertical axis, which is lingually convex and labially concave. The occlusal surface is anteriorly narrower than posteriorly and longer than wide. The anterocone is developed, protrudes forwards and expands lingually. The parastyle and mesostyle are of slightly developed ridge-form. The parastyle is anterolabial to the anterolabial fossette and persists for about a third of the tooth height, with its lower end tending slightly forwards. The mesostyle is posterolabial to the transverse central fossette (=central valley) and persists for about four fifth of the tooth height, with its lower end tending slightly backwards. The anterolabial and anterolingual fossettes are anterolabially directed and connected anteriorly, forming a [-shaped fossettes. The posterolabial and posterolingual fossettes are smaller than the anterior ones and isolated from each other. The transverse central fossette is divided into two isolated lakes: The labial one is transversely elongated, whereas the lingual one is smaller and round. All fossettes extend far deeply into the tooth. The root is long with a clear boundary between the crown and the root, its end shrinks but is open. The anterior part of the root is laterally compressed (fig. 1). It seems unbranched or to branch at a very low position.

The maximum length, width and height of the crown is 3.89 mm, 3.00 mm and 5.52 mm respectively.

Comparison and discussion Compared with the all known genera of Mylagaulidae, the Junggar form is more similar to *Promylagaulus* and different from the others, except for *Crucimys* which lacks P^4 and is therefore incomparable with the Junggar form directly, by the hypsodonty and the lingual convex of the vertical axis of the tooth crown of

P^4. In addition, its P^4 resembles ***Promylagulus*** in still more characters: the presence of tooth root; anteroposteriorly elongated tooth crown; lingually expanded anterocone; and the slightly developed parastyle and mesostyle. However, there are obvious differences between the two forms: in P^4 of *Promylagaulus* the ectoloph is displaced anterior to the mesostyle; there are only three or four fossettes and no central fossettes; the anterolingual and posterolabial fossette are smaller and shallower; the two anterior fossettes are isolated from each other; in P^4 of the Junggar form the ectolophs anterior and posterior to the mesostyle are in alignment (although the ectoloph anterior to the mesostyle is also slightly concave at the lower part of the crown); there are altogether six fossettes and all fossettes seem to extend deeply towards the base of the tooth and the number of the fossettes does not vary with wear.

The Junggar form is similar to *Tschalimys čkhikvadzei* from Middle Miocene of Zaisan Basin in size, hypsodonty and the occlusal pattern. However it should be independant generically of *Tschalimys čkhikvadzei*, mainly because of the rootless crown and the straight vertical axis of the crown of the latter, according to Shevyreva's description and figure.

The occlusal pattern of Junggar sample is also similar to those of the North American aplodontids *Meniscomys* and *Tardontia*. The Junggar P^4 is comparable with *Tardontia nevadans* from Barstovian of Nevada (Shotwell, 1958). Their occlusal patterns are similar in the disposition of cusps and fossettes. Nevertheless, the P^4 of *Tardontia nevadans* is as wide as long, low-crowned, its vertical axis is straight, root is separated at a high position, parastyle and mesostyle seem to be more developed than in Junggar form.

The characters of Junggar form in common with *Meniscomys* are the ridge-formed parastyle and mesostyle, the presence of central fossette and the anterior connection of anterolabial and anterolingual fossette. However, the P^4 of *Meniscomys* is low-crowned with lower ratio of length to width, more developed para- and mesostyle, shallower fossettes and single central fossettes.

Undoubtedly the Junggar form is independant of all the previously known genera of aplodontids. The name *Sinomylagaulus halamagaiensis* is assigned to it.

Judging from the dental morphology, *Promylagaulus, Sinomylagaulus* and *Tschalimys* probably belong to the different lineages derived from *Meniscomys*-like ancestor. It is likely that *Sinomylagaulus* is systematically closer to ***Promylagaulus***. It is provisionally classified in subfamily Promylagaulinae Rensberger, 1980.

Sciuridae Gray, 1821

Atlantoxerus Major, 1893

Atlantoxerus junggarensis sp. nov.

(Fig. 2, A—D)

Derivatio nominis Named after Junggar Basin.

Type locality Tieershabahe in Northern Junggar Basin.

Type level Lower Halamagai Formation of Middle Miocene.

Holotype P^4 sin., V8105.1.

Paratype $M_{1/2}$ dext., V8105.2.

Reference material $M_{1/2}$ sin., V8105.3; M_3 dext., V8105.4.

Measurements Refer to Table 1 of Chinese text.

Diagnosis Large species of *Atlantoxerus* only smaller than *A. giganteus*. P^4 characterized by ill-developed hypocone and protoconule, absence of ridge-connections of metaconule to protoconule and posteroloph, and presence of a small mesostyle. Lower molars characterized by absence of an anteroconid, interrupted metalophid, complete entolophid, well-developed ectolophid; and by the equal length and width of M_3.

Description P^4 (V8105.1) is reverse trapezoid-shaped and lingually elevated. The anterocone is well-developed and protrudes forwards. The mesostyle is small. The hypocone is ill-developed. The protoconule is slightly smaller than the paracone. The metaconule is more developed than the metacone, disconnected from the protocone and posteriorly in contact with the posteroloph. The posteroloph is low. The valley between the metaloph and posteroloph nearly disappears. The appression facet for P^3 is obviously on the anterior wall of the developed anteroloph interior to the anterocone

$M_{1/2}$ (V8105.2) Tooth crown is wider than long. Occlusal surface is parallelogram. The anteroconid is absent. The metalophid is disconnected from the metaconid. The entolophid connects the entoconid with the posterolophid at the hypoconulid. The ectolophid straight; the ectosinus between protoconid and hypoconid obliques posteriorly.

On the well-worn $M_{1/2}$ (V8105.3), the interrupted metalophid, complete entolophid and developed ectolophid are still recognizable. The notch between metaconid and entoconid is deeper than in V8105.2. 4-rooted.

M_3 (V8105.4) Well-worn tooth with width equal to length. The metalophid is interrupted. The entolophid seems to be connected to the posterolophid. The ectolophid is developed.

Atlantoxerus giganteus sp. nov.

Derivatio nominis The largest species of the genus.

Type locality Tiershabahe in Northern Junggar Basin.

Type level Lower Halamagai Formation of Middle Miocene.

Holotype P^4 dext., V8106.

Measurements Refer to Table 1 in Chinese text.

Diagnosis The largest species of *Atlantoxerus*. P^4 characterized by ill-developed hypocone, more developed protoconule, small mesostyle, and ridge-connections of metaconule respectively to protoconule and posteroloph.

Description This species is represented by unique left P^4. It is of lingual hypsodonty. The anterocone is developed and protrudes forwards. The mesostyle is small. The hypocone is ill-developed and nearly merged in the posterior arm of the protocone. The protoconule is slightly bigger than the paracone. The metaconule is more developed than the metacone, connected lingual-posteriorly to the posteroloph and anteriorly to the base of the protoconule with a ridge respectively. The posteroloph is low and narrow. The valley between the posteroloph and metaloph is very narrow.

Comparison and discussion Of the two P^4 V8106 is much larger than V8105.1 and differs morphologically from the latter by the more developed protoconule and the ridge-connections between the metaconule, protoconule and posteroloph. It is reasonable to refer the two P^4 to different species. The three lower molars match V8105.1 in size and should be conspecific with it.

The large species *A. giganteus* (V8106) is so far the biggest species of the genus, however the small species *A. junggarensis* (V8105, 1—4) is larger than all other known species with the exception of the large North African species *A. huvelini* from Early Pleistocene of Morocco, Irhoud-Ocre.

Morphologically the Junggar species obviously differ from the African species *A. tadlae* and *A. huvelini* which are characterized by the rugose enamel tooth surface, weak entolophid of lower molars and the evidently elongated M_3, by the smooth enamel tooth surface, equal length and width of M_3 and the complete entolophid of lower molars.

On the other hand, the Junggar forms are distinguished from the European species *A. blacki, A. adroveri, A. rhodius* and the North African species *A. getulus* by the much less developed hypocone of P^4, although they have shared characteristics: $M_{1/2}$ is wider than long, the complete absence of an anteroconid and the developed metaconule of P^4.

Besides, *A. junggarensis* still differs from *A. getulus* in the absence of ridge-connections of metaconule to the posteroloph on P^4; from *A. rhodius* in the interrupted metalophid of $M_{1/2}$ and the complete absence of the anteroconid on lower molars; from *A. adroveri* in possessing the mesostyle on P^4; from *A. blacki* in the entolophid on the lower molars, which is connected only to the posterolophid but not to the hypoconid like in *A. blacki*. Furthermore, *A. giganteus* still differs from *A. rhodius* and *A. blacki* in possessing ridges connecting the metaconule to the posteroloph and the protoconule respectively; from *A. adroveri* in the presence of a mesostyle.

However the P^4 of *A. junggarensis* is morphologically similar to the $M^{1/2}$ of Turkish species *A.* sp. II of Bayraktepe II in the ill-developed hypocone and the developed anteroloph, the presence of the mesostyle and the absence of the ridge connecting the metaconule to the posteroloph.

The relationship between the various species of *Atlantoxerus* is not yet clear enough. As far as the two species from Junggar are concerned, they are, as mentioned above, similar to the Turkish species *A.* sp. II of Bayraktepe II in the ill-developed hypocene which is well-developed in the other European species, in addition, the Turkish species is also large in size. It is possible that *A. junggarensis* is more closely related to the Turkish *A.* sp. II.

The discovery of *Atlantoxerus* in the Junggar Basin makes the geographic range of this genus extended to the Central Asia.

Castoridae Gray, 1821

Amblycastor Matthew, 1918 = *Anchitheriomys* Roger, 1898

Amblycastor tungurensis Stirton, 1934

(Fig. 3)

Material $M^{1/2}$ sin., V8133.

Locality East of Botamoyin in Northern Junggar Basin.

Age and horison Middle Miocene, Lower Halamagai Formation.

The specimen was collected at the field locality No. 82502 about 10 km from where *Sinomylagaulus halamagaiensis, Atlantoxerus giganteus* and *A. junggarensis* yielded.

Compared with the type specimen M^1 of Tung Gur Stirton described in 1934, the Junggar specimen is very similar to it in the complicated occlusal dental pattern and the size,

only the metafossette is slightly more complicated and two of the anterior lingual fossettes are combined into one. The measurements are: length 7.56 mm, width 8.49 mm and height 11.40 mm.

In addition to Tunggur Formation, *Amblycastor tungurensis* has been found from Sarybulak Formation of Zaisan Basin, which according to A. K. Agadjanyan (1985), is biochronologically equivalent to MN 7—8 of European land mammal age, roughly the same as for Tunggur Formation (Li, Wu et Qiu, 1984). The discovery of *A. tungurensis* from the Lower Halamagai Formation therefore indicates that the age of this Formation is of MN 7—8 (Astaracian).